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A METHOD FOR DETERMINING OIL MISTS BY FLUORESCENCE

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Since lubricating oils used in metalworking shops tend to form oil mists through heating or spraying, it is necessary to have a sensitive method for determining their presence in the air in order to combat the obvious hazard they cause for the workers.

The currently-used gravimetric analysis is too prolonged and not sufficiently sensitive, and in view of its shortcomings these authors advance a method based on the fact that saturated hydrocarbons (the main constituents of mineral oils) glow with a blue or violet hue in ultraviolet light.

Experiments were conducted with Drogobychkiy spindle, machine, compressor, and cylinder oils; and it was established that at concentrations not exceeding 10^{-4} to $4 \cdot 10^{-5}$ grams per milliliter the intensity of luminescence of the oil solutions is proportional to the amount of oil in the solution.

Therefore, a visual fluorescence method of determination was devised, employing dichloroethane as solvent, a PRK-4 mercury-quartz vacuum tube as the source of ultraviolet light, and an assembly recommended by M. A. Konstantinova-Shlezinger(1).

Standard solutions, prepared by a method corresponding to actual conditions (that is, taking into account whether the mist was formed by spraying or by heating, because the fluorescence shade varies with the temperature of mist formation) were made containing 0.000, 0.005, 0.02, 0.04, 0.06, 0.08, 0.10, 0.20, 0.30, and 0.40 milligram per 4 milliliters of dichloroethane.

The mist generator especially constructed for the preparation of standard solutions consisted of a wide part, closed with a stopper at one end and with an opening 7-8 milliliter in diameter in the other end, and of a narrow part which was combined with a 500-mililiter evacuated pipette. The total volume of the mist generator was not more than 50 milliliter.

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The oil (usually 15-20 drops) was introduced into the mist generator from a dropper, the weight of the oil having been previously determined. The mist generator was placed in a sand basin so that it would be on the same level as the mercury reservoir of the thermometer. This sand basin was heated to the desired temperature, and then the tube of the dropper was introduced into the mist generator to a level 1-2 centimeters below the stopper, and 1-2 drops of oil were released before the dropper was withdrawn.

The mist was drawn off into the pipette; and after the mist generator had been removed from the basin, the residue was weighed.

The pipette was allowed to stand for 30-40 minutes before it was washed with dichloroethane and the resulting solution was poured off into a 25-50 milliliters measuring flask. The dichloroethane pouring off from the pipette was checked in ultraviolet light. The solution in the measuring flask was then brought up to the mark and a standard solution having a concentration of 0.10 milligrams oil per 1.0 milliliters solution was prepared from it.

The difference in the weight of the mist generator before and after the experiment indicated the portion of the oil which was not used up in the formation of the fog. Subtraction of this quantity then from the original weight of the oil gave the amount of oil in the measuring flask. The solutions in the measuring flasks prepared from samples were matched against standard solutions in order to gauge the quantities of oil in them (according to their intensities of luminescence).

This method saves time, since no chemical reaction is involved. The procedure is described as simple, accurate, and sensitive in the ranges of 0.005-0.40 milligrams in 4.0 milliliters, and is recommended for use in the shops.

Results were presented in the following table:

Determination of Mineral Oil by the Fluorescence Method

Amt of Oil Used (mg)	Oil Found (mg)	Deviation (mg)
0.005	0.004	-0.001
0.010	0.010	--
0.015	0.020	+0.005
0.030	0.040	+0.010
0.040	0.040	--
0.050	0.050	--

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